NORDIC LAM™

1-1/2-INCH WALL STUDS

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NORDIC LAM™
WALL STUDS

SCOPE

This technical note features stud tables for glued laminated studs. These stud tables are intended for determining the feasibility of using tall wood stud walls for a given residential application. In a commercial application, a fully engineered design is required for each tall wall to consider the specific design considerations for that site, the effect of openings, the connections and other details. This document addresses the design of wall studs for wind perpendicular to the wall surface and vertical loads only. Complete structural analysis with consideration of loads originating from adjoining elements (e.g. lateral shear loads) is beyond the scope of this publication.

ASSUMPTIONS USED TO DEVELOP THE STUD TABLES

- The studs are laterally braced to prevent buckling in the narrow dimension.
- The loads are uniformly distributed along the top of the wall.
- The Component & Cladding (C&C) loads shown in the Wall Design Wind Load table are used in strength calculations (Table D).
- The wind loads have been taken as 0.42 times the C&C loads for the purpose of the determining deflection limits herein (per IBC 2012, Table 1604.3.)
- Total load deflection criteria is stud length/120. Calculated total load deflection for each stud is given in the tables.
- The ratio of specified axial dead load to live load is 1. The tables can be used conservatively when the specified axial dead load is less than the specified axial live load.
- Stud sizes are based on Allowable Stress Design. The load combinations considered are:
    1. axial load alone
    2. axial dead load plus wind, and
    3. axial dead load plus wind plus axial live load
- In conformance with the IBC, a load reduction factor of 0.75 is applied to the wind and axial live loads in load combination 3.
- Load cases 2 and 3 are based on a load duration factor of 1.60.
- Eccentric axial loading of the studs is considered with maximum eccentricity equal to 1/6th of the stud depth.
- Studs are assumed to be pinned at both ends (buckling length coefficient, K_e = 1.0).
- The tables can only be used for untreated studs in dry service conditions.
- Resistance values were calculated based on published values and NDS 2012.

TABLE A.
LIMITATIONS OF CONVENTIONAL CONSTRUCTION[1,2]

TYPE OF WALL	STUD SIZE	STUD HEIGHT[3]	MAXIMUM SPACING
Walls supporting roof and ceiling only	2x4 2x6	10' 10'	24" 24"
Walls supporting one floor, roof and ceiling	2x4 2x6	10' 10'	16" 24"
Walls supporting two floors, roof and ceiling	2x4 2x6	10' 10'	--- 16"
Walls supporting one floor only	2x4 2x6	10' 10'	24" 24"
Nonbearing walls	2x4 2x6	14' 20'	24" 24"

(1) Per IRC, Table R602.3(5)
(2) Maximum wind speed: 100 mph (3-second gust), per IRC, Section R301.2.1.1
(3) Listed heights are distances between points of lateral support placed perpendicular to the plane of the wall.

HOW TO USE THE TABLES

- Determine the BASIC WIND SPEED for the building location. This is found in the 2012 IRC, Figure R301.2(4); 2012 IBC, Figure 1609; ASCE 7-10, Figure 6-1 (*see Technical Note 13*); or may be obtained from the local jurisdiction.
- Determine the EFFECTIVE WIND AREA for the appropriate wall height (Table C).
- Determine the WALL DESIGN WIND LOAD in psf for the effective wind area and basic wind speed (Table D). Linear interpolation between 10 ft^2 and 100 ft^2 is acceptable, otherwise use the load associated with the lower effective area.
- Adjust the Wall Design Wind Load for height and exposure by multiplying by the appropriate ADJUSTMENT COEFFICIENT (Table E).
- Calculate the LATERAL LOAD in plf based on the spacing of the studs.

  Lateral Load (plf) = Adjusted Wall Design Wind Load (psf) x Stud On-Center Spacing (ft)
- Calculate the uniformly distributed dead load based on structure supported. Also, consideration is to be given to the self weight of the wall. Under many conditions it is appropriate to include the weight of the top half of the wall.
- Calculate the uniformly distributed live load based on live loads due to snow and associated rain and tributary width of the roof.
- The stud tables are appropriate for the typical case where the axial dead load does not exceed the axial live load.
- Calculate the total AXIAL LOAD in lbs based on the spacing of the studs.

  Axial Load (lbs) = [Dead Load (plf) + Live Load (plf)] x Stud On-Center Spacing (ft)
- **Studs:** Select a stud depth based on the stud length and the axial load (Table 1). The associated DEFLECTION should be considered for appropriateness where finishes are susceptible to cracking (Table B).
- **Columns and/or headers:** Select a column for lateral and axial loads which are greater than or equal to calculated loads (Tables 2, 4, and 6), and/or a header for lateral and uniform loads which are greater than or equal to calculated loads (Tables 3, 5, and 7).

TABLE B.
TYPICAL DEFLECTION REQUIREMENTS

TYPE OF WALL	MAXIMUM DEFLECTION
Exterior walls with plaster or stucco finish	L/360
Exterior walls with brittle finishes	L/240
Exterior walls with flexible finishes	L/120
Members supporting windows	L/175

Note: For finishes that require a deflection stricter than L/360, use a design software or contact your local distributor.

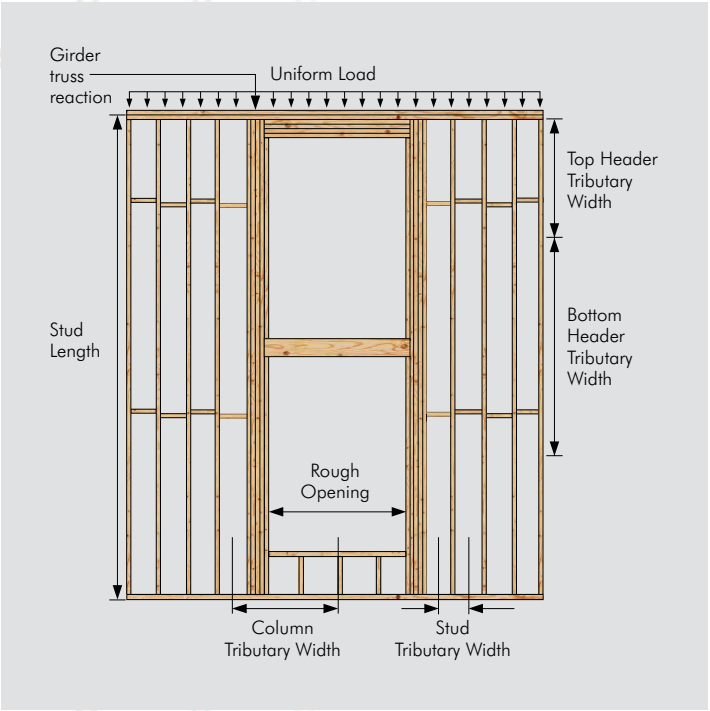

TABLE C.
EFFECTIVE WIND AREA

WALL HEIGHT (ft)	EFFECTIVE WIND AREA (ft^2)
10	33
12	48
14	65
16	85
≥ 18	100

NOTE:

1. Values are based on $L^2/3$ with a maximum of 100 ft^2, where L = wall height (ft).

TABLE D.
WALL DESIGN WIND LOAD (psf)

EFFECTIVE WIND AREA (ft^2)	BASIC WIND SPEED (mph)							
	85	90	100	110	120	130	140	150
≤ 10	14.1	15.8	19.5	23.6	28.1	33.0	38.2	43.9
20	13.5	15.1	18.7	22.6	26.9	31.6	36.7	42.1
50	12.7	14.3	17.6	21.3	25.4	29.8	34.6	39.7
≥ 100	12.2	13.6	16.8	20.4	24.2	28.4	33.0	37.8

NOTES:

1. Tabulated wind loads are based on the analytical procedure defined in ASCE 7-10 (3-second gust). Design wind pressures on C&C elements in the interior zone of an enclosed structure have been determined with the following assumptions:
   - Topographical factor of 1.0
   - Importance factor of 1.0
   - Mean roof height of 30 feet
   - Exposure Category B
2. The effective wind area is the span length multiplied by an effective width that need not be less than one-third the span length. For effective areas between those given above the load may be interpolated, otherwise use the load associated with the lower effective area.
3. See 2012 IRC, Figure R301.2(4); 2012 IBC, Figure 1609; or ASCE 7-10, Figure 6-1 (see Technical Note 13) for basic wind speeds.
4. Table values shall be adjusted for height and exposure by multiplying by the adjustment coefficient in Table E.
5. To calculate the lateral load along the stud (in plf), multiply the adjusted wall design wind load (in psf) by the stud on-center spacing (in ft).

TABLE E.
HEIGHT AND EXPOSURE ADJUSTMENT COEFFICIENTS

MEAN ROOF HEIGHT (ft)	EXPOSURE		
	B	C	D
15	1.00	1.21	1.47
20	1.00	1.29	1.55
25	1.00	1.35	1.61
30	1.00	1.40	1.66
35	1.05	1.45	1.70
40	1.09	1.49	1.74
45	1.12	1.53	1.78
50	1.16	1.56	1.81
55	1.19	1.59	1.84
60	1.22	1.62	1.87

NOTES:

1. The mean roof height is the average of the roof eave height and the height to the highest point on the roof surface, except that eave height shall be used for roof angle of less than or equal to 10 degrees.
2. The exposure categories are generally defined as follows (see ASCE 7-10, Section 6.5.6 for complete definitions):
   Exposure B: Urban and suburban areas, wooded areas.
   Exposure C: Open terrain with scattered obstructions having heights generally less than 30 ft.
   Exposure D: Flat, unobstructed areas.

ES11 STUDS

TABLE 1.
ALLOWABLE AXIAL LOADS AND LATERAL DEFLECTIONS

STUD LENGTH (ft)	AXIAL LOAD / DEFLECTION RATIO	NORDIC LAM 1-1/2" x 5-1/2" LATERAL LOAD (plf)					NORDIC LAM 1-1/2" x 7-1/4" LATERAL LOAD (plf)				
		15	20	30	40	50	15	20	30	40	50
8	Axial Load (lbs)	4641	4641	4641	4641	4641	6117	6117	6117	6117	6117
	Deflection Ratio	L/5157	L/3868	L/2578	L/1934	L/1547	L/11814	L/8860	L/5907	L/4430	L/3544
9	Axial Load (lbs)	4641	4641	4641	4641	4641	6117	6117	6117	6117	6117
	Deflection Ratio	L/3622	L/2716	L/1811	L/1358	L/1086	L/8297	L/6223	L/4148	L/3111	L/2489
10	Axial Load (lbs)	4548	4548	4548	4548	4548	6117	6117	6117	6117	6117
	Deflection Ratio	L/2640	L/1980	L/1320	L/990	L/792	L/6048	L/4536	L/3024	L/2268	L/1814
11	Axial Load (lbs)	4126	4126	4126	4126	4126	6117	6117	6117	6117	6117
	Deflection Ratio	L/1984	L/1488	L/992	L/744	L/595	L/4544	L/3408	L/2272	L/1704	L/1363
12	Axial Load (lbs)	3739	3739	3739	3739	3596	6117	6117	6117	6117	6117
	Deflection Ratio	L/1528	L/1146	L/764	L/573	L/458	L/3500	L/2625	L/1750	L/1312	L/1050
13	Axial Load (lbs)	3391	3391	3391	3273	2976	6074	6074	6074	6074	6074
	Deflection Ratio	L/1202	L/901	L/601	L/450	L/360	L/2753	L/2064	L/1376	L/1032	L/825
14	Axial Load (lbs)	3082	3082	3063	2751	2443	5645	5645	5645	5645	5645
	Deflection Ratio	L/962	L/721	L/481	L/360	L/288	L/2204	L/1653	L/1102	L/826	L/661
15	Axial Load (lbs)	2809	2809	2623	2302	1985	5240	5240	5240	5240	5240
	Deflection Ratio	L/782	L/586	L/391	L/293	L/234	L/1792	L/1344	L/896	L/672	L/537
16	Axial Load (lbs)	2566	2566	2242	1915	1589	4863	4863	4863	4863	4619
	Deflection Ratio	L/644	L/483	L/322	L/241	L/193	L/1476	L/1107	L/738	L/553	L/443
17	Axial Load (lbs)	2352	2254	1912	1578	1245	4516	4516	4516	4392	4001
	Deflection Ratio	L/537	L/403	L/268	L/201	L/161	L/1231	L/923	L/615	L/461	L/369
18	Axial Load (lbs)	2151	1971	1625	1286	943	4198	4198	4198	3852	3451
	Deflection Ratio	L/452	L/339	L/226	L/169	L/135	L/1037	L/777	L/518	L/388	L/311
19	Axial Load (lbs)	1906	1724	1374	1029		3908	3908	3787	3371	2960
	Deflection Ratio	L/385	L/288	L/192	L/144		L/881	L/661	L/440	L/330	L/264
20	Axial Load (lbs)	1689	1507	1154	803		3644	3644	3366	2941	2521
	Deflection Ratio	L/330	L/247	L/165	L/123		L/756	L/567	L/378	L/283	L/226
21	Axial Load (lbs)	1499	1315	960			3404	3404	2988	2557	2128
	Deflection Ratio	L/285	L/213	L/142			L/653	L/489	L/326	L/244	L/195
22	Axial Load (lbs)	1330	1146	787			3185	3098	2649	2212	1775
	Deflection Ratio	L/248	L/186	L/124			L/568	L/426	L/284	L/213	L/170
23	Axial Load (lbs)						2985	2798	2345	1901	1457
	Deflection Ratio						L/497	L/372	L/248	L/186	L/149
24	Axial Load (lbs)						2765	2528	2070	1621	1030
	Deflection Ratio						L/437	L/328	L/218	L/164	L/131
25	Axial Load (lbs)						2522	2283	1822	1368	
	Deflection Ratio						L/387	L/290	L/193	L/145	
26	Axial Load (lbs)						2302	2061	1597	1137	
	Deflection Ratio						L/344	L/258	L/172	L/129	
27	Axial Load (lbs)						2102	1860	1393		
	Deflection Ratio						L/307	L/230	L/153		
28	Axial Load (lbs)						1919	1677	1208		
	Deflection Ratio						L/275	L/206	L/137		
29	Axial Load (lbs)						1753	1510	1038		
	Deflection Ratio						L/248	L/186	L/124		
30	Axial Load (lbs)						1601	1358			
	Deflection Ratio						L/224	L/168			

NOTES:

1. Values shown are the allowable axial loads, in pounds (lbs), that can be applied to the stud in addition to the lateral load, and the deflection ratio, based on the span (L).
2. The table is based on dry-use conditions. The values are based on a duration of load factor of 1.60 for combined axial and lateral loads.
3. The designer must ensure that the design assumptions used to develop the table are appropriate for the application. See page 2 for stud table design assumptions. For additional design information, contact Nordic Engineered Wood.
4. The table is based on a compression perpendicular-to-grain stress of 450 psi, adjusted per NDS 2012, 3.10.4.
5. One face of the stud must be laterally supported by sheathing, fastened to meet the requirements of IRC or IBC. The other face must be sheathed with either structural sheathing or drywall.
6. Maximum spacing of full depth blocking is 8 ft.

ES12 COLUMNS

L/360 LATERAL DEFLECTION RATIO

TABLE 2.
ALLOWABLE AXIAL AND LATERAL LOADS

COLUMN LENGTH (ft)	AXIAL AND LATERAL LOADS	5-1/2" WALL THICKNESS					7-1/4" WALL THICKNESS				
		1-1/2" 2x	1-1/2" 3x	3-1/2"	5-1/2"	7-1/4" (Plank)	1-1/2" 2x	1-1/2" 3x	3-1/2"	5-1/2"	7-1/4"
8	Axial Load (lbs)	8353	12066	9591	14541	18872	11011	15905	35480	55055	72183
	Lateral Load (plf)	255	300	300	300	300	300	300	300	300	300
9	Axial Load (lbs)	8353	12066	9591	14541	18872	11011	15905	35480	55055	72183
	Lateral Load (plf)	202	300	300	300	300	300	300	300	300	300
10	Axial Load (lbs)	8353	12066	9591	14541	18872	11011	15905	35480	55055	72183
	Lateral Load (plf)	163	245	231	300	300	284	300	300	300	300
11	Axial Load (lbs)	7995	11992	9591	14541	18872	11011	15905	35480	55055	72183
	Lateral Load (plf)	124	186	174	273	300	235	300	300	300	300
12	Axial Load (lbs)	7319	10978	9591	14541	18872	11011	15905	35480	55055	72183
	Lateral Load (plf)	96	143	134	210	277	197	296	300	300	300
13	Axial Load (lbs)	6692	10038	9591	14541	18872	11011	15905	35480	55055	72183
	Lateral Load (plf)	75	113	105	165	218	168	252	300	300	300
14	Axial Load (lbs)	6121	9182	9591	14541	18872	10888	15905	35480	55055	72183
	Lateral Load (plf)	60	90	84	132	174	138	207	300	300	300
15	Axial Load (lbs)	5603	8411	8734	13745	18124	10194	15291	35480	55055	72183
	Lateral Load (plf)	49	73	68	108	142	112	168	300	300	300
16	Axial Load (lbs)	5120	7691	7923	12469	16443	9529	14294	35480	55055	72183
	Lateral Load (plf)	40	60	56	89	117	92	138	300	300	300
17	Axial Load (lbs)	4692	7049	7216	11356	14974	8903	13355	35480	55055	72183
	Lateral Load (plf)	34	50	47	74	97	77	115	300	300	300
18	Axial Load (lbs)	4313	6480	6595	10380	13687	8320	12480	35480	55055	72183
	Lateral Load (plf)	28	42	40	62	82	65	97	272	300	300
19	Axial Load (lbs)	3976	5973	6049	9520	12554	7778	11670	35480	55055	72183
	Lateral Load (plf)	24	36	34	53	70	55	83	231	300	300
20	Axial Load (lbs)	3675	5521	5566	8761	11553	7252	10912	33901	52705	69011
	Lateral Load (plf)	21	31	29	45	60	47	71	198	300	300
21	Axial Load (lbs)	3405	5117	5138	8087	10664	6773	10192	31463	48939	64100
	Lateral Load (plf)	18	27	25	39	52	41	61	171	269	300
22	Axial Load (lbs)	3164	4754	4756	7486	9871	6336	9536	29270	45548	59675
	Lateral Load (plf)	16	23	22	34	45	36	53	149	234	300
23	Axial Load (lbs)						5938	8937	27290	42485	55677
	Lateral Load (plf)						31	47	131	205	270
24	Axial Load (lbs)						5574	8389	25500	39713	52057
	Lateral Load (plf)						27	41	115	180	238
25	Axial Load (lbs)						5240	7888	23876	37196	48769
	Lateral Load (plf)						24	36	102	160	211
26	Axial Load (lbs)						4935	7429	22398	34906	45776
	Lateral Load (plf)						22	32	90	142	187
27	Axial Load (lbs)						4654	7007	21051	32817	43044
	Lateral Load (plf)						19	29	81	127	167
28	Axial Load (lbs)						4396	6618	19820	30907	40545
	Lateral Load (plf)						17	26	72	114	150
29	Axial Load (lbs)						4158	6260	18692	29155	38254
	Lateral Load (plf)						16	23	65	102	135
30	Axial Load (lbs)						3938	5930	17656	27547	36149
	Lateral Load (plf)						14	21	59	92	122

NOTES:

1. Values shown are the maximum axial loads, in pounds (lbs), and lateral loads, in pounds per lineal foot (plf), that can be applied to the column.
2. Selected column shall satisfy both total axial and lateral wind loads. Refer to page 3 for determining the lateral load.
3. The table is based on dry-use conditions. The values are based on a duration of load factor of 1.60 for combined axial and lateral loads, and 1.00 for axial load only.
4. The table is based on a compression perpendicular-to-grain stress of 450 psi.
5. 1-1/2-inch built-up columns have been designed for ES11 stud grade. Built-up columns shall be nailed in accordance with NDS 2012, 15.3.3.
6. One face of the column must be laterally supported by sheathing, fastened to meet the requirements of IRC or IBC. The other face must be sheathed with either structural sheathing or drywall.
7. Maximum spacing of full depth blocking is 8 ft.

24F HEADERS

L/360 LATERAL DEFLECTION RATIO

TABLE 3.
ALLOWABLE UNIFORM AND LATERAL LOADS (plf)

WIDTH (in.)	DEPTH (in.)	CRITERIA	ROUGH OPENING (ft)									
			3	4	5	6	7	8	9	10	11	12
5-1/2	3-1/2	L/240 TL	697	402	257	176	128	84	51	--	--	--
		L/360 WL	500	500	500	500	340	230	164	--	--	--
		End B.	1.50	1.50	1.50	1.50	1.50	1.50	1.50	--	--	--
	5-1/2	L/240 TL	2785	2128	1438	806	450	404	253	165	112	77
		L/360 WL	500	500	500	500	445	302	214	157	119	92
		End B.	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
	7-1/4	L/240 TL	3671	2805	2269	1759	1012	748	587	386	263	184
		L/360 WL	500	500	500	500	500	398	282	207	157	122
		End B.	1.90	1.90	1.90	1.70	1.50	1.50	1.50	1.50	1.50	1.50
	9-1/4	L/240 TL	4684	3579	2895	2430	2093	1245	1113	809	554	390
		L/360 WL	500	500	500	500	500	500	360	265	200	155
		End B.	2.40	2.40	2.40	2.40	2.40	1.60	1.60	1.50	1.50	1.50
	11-1/4	L/240 TL	5696	4353	3521	2955	2545	2235	1646	1463	1003	709
		L/360 WL	500	500	500	500	500	500	438	322	243	189
		End B.	2.90	2.90	2.90	2.90	2.90	2.90	2.40	2.30	1.80	1.50
7	3-1/2	L/240 TL	887	512	327	225	163	107	65	--	--	--
		L/360 WL	500	500	500	500	500	475	337	--	--	--
		End B.	1.50	1.50	1.50	1.50	1.50	1.50	1.50	--	--	--
	5-1/2	L/240 TL	2128	1208	771	532	387	293	228	174	117	80
		L/360 WL	500	500	500	500	500	500	500	389	294	228
		End B.	1.70	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
	7-1/4	L/240 TL	4672	3570	2888	2243	1663	1187	747	491	335	234
		L/360 WL	500	500	500	500	500	500	500	428	323	251
		End B.	1.90	1.90	1.90	1.70	1.50	1.50	1.50	1.50	1.50	1.50
	9-1/4	L/240 TL	5961	4555	3684	3092	2664	2087	1561	1030	705	497
		L/360 WL	500	500	500	500	500	500	500	500	413	320
		End B.	2.40	2.40	2.40	2.40	2.40	2.10	1.80	1.50	1.50	1.50
	11-1/4	L/240 TL	7250	5540	4481	3761	3239	2844	2451	1862	1277	903
		L/360 WL	500	500	500	500	500	500	500	500	500	389
		End B.	2.90	2.90	2.90	2.90	2.90	2.90	2.80	2.30	1.80	1.50

NOTES:

1. Values shown are the maximum uniform (vertical) and lateral loads, in pounds per lineal foot (plf), that can be applied to the header in addition to its own weight.
2. Selected header shall satisfy both total vertical (TL) and wind loads (WL). Refer to page 3 for determining the lateral load.
3. The table is based on uniform loads and dry-use conditions. The values are based on a duration of load factor of 1.60 for combined uniform and lateral loads, and 1.00 for uniform load only.
4. The total load deflection is limited to the most restrictive of L/240 or 5/16 inch.
5. Trimmers shall support the full header width. Verify trimmer maximum allowable axial load to support the header.
6. Multiple pieces may be used when properly connected.
7. Sufficient bearing length shall be provided at supports. Review bearing length requirements (shown in inches) to ensure adequacy.

ES12 COLUMNS

L/240 LATERAL DEFLECTION RATIO

TABLE 4.
ALLOWABLE AXIAL AND LATERAL LOADS

COLUMN LENGTH (ft)	AXIAL AND LATERAL LOADS	5-1/2" WALL THICKNESS					7-1/4" WALL THICKNESS				
		1-1/2" 2x	1-1/2" 3x	3-1/2"	5-1/2"	7-1/4" (Plank)	1-1/2" 2x	1-1/2" 3x	3-1/2"	5-1/2"	7-1/4"
8	Axial Load (lbs)	8353	12066	9591	14541	18872	11011	15905	35480	55055	72183
	Lateral Load (plf)	255	300	300	300	300	300	300	300	300	300
9	Axial Load (lbs)	8353	12066	9591	14541	18872	11011	15905	35480	55055	72183
	Lateral Load (plf)	202	300	300	300	300	300	300	300	300	300
10	Axial Load (lbs)	8353	12066	9591	14541	18872	11011	15905	35480	55055	72183
	Lateral Load (plf)	163	245	300	300	300	284	300	300	300	300
11	Axial Load (lbs)	7701	11551	9591	14541	18872	11011	15905	35480	55055	72183
	Lateral Load (plf)	135	203	260	300	300	235	300	300	300	300
12	Axial Load (lbs)	6811	10216	9591	14541	18872	11011	15905	35480	55055	72183
	Lateral Load (plf)	113	170	201	300	300	197	296	300	300	300
13	Axial Load (lbs)	6050	9076	9591	14541	18872	11011	15905	35480	55055	72183
	Lateral Load (plf)	97	145	158	248	300	168	252	300	300	300
14	Axial Load (lbs)	5400	8099	9203	14462	18872	10646	15905	35480	55055	72183
	Lateral Load (plf)	83	125	126	198	262	145	217	300	300	300
15	Axial Load (lbs)	4841	7261	8376	13162	17350	9684	14526	35480	55055	72183
	Lateral Load (plf)	73	109	103	161	213	126	189	300	300	300
16	Axial Load (lbs)	4470	6705	7645	12014	15836	8830	13245	35480	55055	72183
	Lateral Load (plf)	60	91	85	133	175	111	166	300	300	300
17	Axial Load (lbs)	4150	6225	6998	10998	14497	8072	12108	35480	55055	72183
	Lateral Load (plf)	50	76	71	111	146	98	147	300	300	300
18	Axial Load (lbs)	3856	5785	6426	10097	13310	7399	11098	35480	55055	72183
	Lateral Load (plf)	42	64	59	93	123	88	131	300	300	300
19	Axial Load (lbs)	3588	5382	5917	9298	12256	6799	10199	35480	55055	72183
	Lateral Load (plf)	36	54	51	79	105	79	118	300	300	300
20	Axial Load (lbs)	3344	5015	5464	8586	11317	6268	9402	32363	52705	69011
	Lateral Load (plf)	31	46	43	68	90	71	106	298	300	300
21	Axial Load (lbs)	3121	4681	5059	7949	10479	5923	8884	30150	48939	64100
	Lateral Load (plf)	27	40	37	59	78	61	92	257	300	300
22	Axial Load (lbs)	2918	4376	4696	7379	9727	5598	8396	28143	45273	59675
	Lateral Load (plf)	23	35	33	51	67	53	80	224	300	300
23	Axial Load (lbs)						5293	7939	26320	40911	55677
	Lateral Load (plf)						47	70	196	300	300
24	Axial Load (lbs)						5008	7511	24661	38097	51900
	Lateral Load (plf)						41	62	172	271	300
25	Axial Load (lbs)						4742	7112	23148	35784	47309
	Lateral Load (plf)						36	54	152	240	300
26	Axial Load (lbs)						4493	6740	21766	33667	43940
	Lateral Load (plf)						32	48	136	213	281
27	Axial Load (lbs)						4262	6393	20500	31727	41422
	Lateral Load (plf)						29	43	121	190	251
28	Axial Load (lbs)						4047	6070	19339	29946	39109
	Lateral Load (plf)						26	39	108	170	225
29	Axial Load (lbs)						3846	5769	18271	28306	36979
	Lateral Load (plf)						23	35	98	153	202
30	Axial Load (lbs)						3659	5488	17288	26795	35014
	Lateral Load (plf)						21	32	88	139	183

NOTES:

1. Values shown are the maximum axial loads, in pounds (lbs), and lateral loads, in pounds per lineal foot (plf), that can be applied to the column.
2. Selected column shall satisfy both total axial and lateral wind loads. Refer to page 3 for determining the lateral load.
3. The table is based on dry-use conditions. The values are based on a duration of load factor of 1.60 for combined axial and lateral loads, and 1.00 for axial load only.
4. The table is based on a compression perpendicular-to-grain stress of 450 psi.
5. 1-1/2-inch built-up columns have been designed for ES11 stud grade. Built-up columns shall be nailed in accordance with NDS 2012, 15.3.3.
6. One face of the column must be laterally supported by sheathing, fastened to meet the requirements of IRC or IBC. The other face must be sheathed with either structural sheathing or drywall.
7. Maximum spacing of full depth blocking is 8 ft.

24F HEADERS
L/240 LATERAL DEFLECTION RATIO

TABLE 5.
ALLOWABLE UNIFORM AND LATERAL LOADS (plf)

WIDTH (in.)	DEPTH (in.)	CRITERIA	ROUGH OPENING (ft)									
			3	4	5	6	7	8	9	10	11	12
5-1/2	3-1/2	L/240 TL	697	402	257	176	128	84	51	--	--	--
		L/240 WL	500	500	500	500	500	346	245	--	--	--
		End B.	1.50	1.50	1.50	1.50	1.50	1.50	1.50	--	--	--
	5-1/2	L/240 TL	2785	2128	1438	806	396	304	240	165	112	77
		L/240 WL	500	500	500	500	472	364	290	236	179	138
		End B.	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
	7-1/4	L/240 TL	3671	2805	2269	1759	1012	531	420	340	263	184
		L/240 WL	500	500	500	500	500	480	382	311	235	182
		End B.	1.90	1.90	1.90	1.70	1.50	1.50	1.50	1.50	1.50	1.50
	9-1/4	L/240 TL	4684	3579	2895	2430	2093	1245	686	557	554	390
		L/240 WL	500	500	500	500	500	500	488	397	300	233
		End B.	2.40	2.40	2.40	2.40	2.40	1.60	1.50	1.50	1.50	1.50
	11-1/4	L/240 TL	5696	4353	3521	2955	2545	2235	1394	825	826	709
		L/240 WL	500	500	500	500	500	500	500	483	365	283
		End B.	2.90	2.90	2.90	2.90	2.90	2.90	2.00	1.50	1.50	1.50
7	3-1/2	L/240 TL	887	512	327	225	163	107	65	--	--	--
		L/240 WL	500	500	500	500	500	500	500	--	--	--
		End B.	1.50	1.50	1.50	1.50	1.50	1.50	1.50	--	--	--
	5-1/2	L/240 TL	2128	1208	771	532	387	293	228	174	117	80
		L/240 WL	500	500	500	500	500	500	500	500	442	342
		End B.	1.70	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
	7-1/4	L/240 TL	4672	3570	2888	2243	1663	1187	747	434	335	234
		L/240 WL	500	500	500	500	500	500	500	491	407	343
		End B.	1.90	1.90	1.90	1.70	1.50	1.50	1.50	1.50	1.50	1.50
	9-1/4	L/240 TL	5961	4555	3684	3092	2664	2087	1561	1030	640	492
		L/240 WL	500	500	500	500	500	500	500	500	500	438
		End B.	2.40	2.40	2.40	2.40	2.40	2.10	1.80	1.50	1.50	1.50
	11-1/4	L/240 TL	7250	5540	4481	3761	3239	2844	2451	1862	1277	840
		L/240 WL	500	500	500	500	500	500	500	500	500	500
		End B.	2.90	2.90	2.90	2.90	2.90	2.90	2.80	2.30	1.80	1.50

NOTES:

1. Values shown are the maximum uniform (vertical) and lateral loads, in pounds per linear foot (plf), that can be applied to the header in addition to its own weight.
2. Selected header shall satisfy both total vertical (TL) and wind loads (WL). Refer to page 3 for determining the lateral load.
3. The table is based on uniform loads and dry-use conditions. The values are based on a duration of load factor of 1.60 for combined uniform and lateral loads, and 1.00 for uniform load only.
4. The total load deflection is limited to the most restrictive of L/240 or 5/16 inch.
5. Trimmers shall support the full header width. Verify trimmer maximum allowable axial load to support the header.
6. Multiple pieces may be used when properly connected.
7. Sufficient bearing length shall be provided at supports. Review bearing length requirements (shown in inches) to ensure adequacy.

ES12 COLUMNS

L/180 LATERAL DEFLECTION RATIO

L/180

TABLE 6.
ALLOWABLE AXIAL AND LATERAL LOADS

COLUMN LENGTH (ft)	AXIAL AND LATERAL LOADS	5-1/2" WALL THICKNESS					7-1/4" WALL THICKNESS				
		1-1/2" 2x	1-1/2" 3x	3-1/2"	5-1/2"	7-1/4" (Plank)	1-1/2" 2x	1-1/2" 3x	3-1/2"	5-1/2"	7-1/4"
8	Axial Load (lbs)	8353	12066	9591	14541	18872	11011	15905	35480	55055	72183
	Lateral Load (plf)	255	300	300	300	300	300	300	300	300	300
9	Axial Load (lbs)	8353	12066	9591	14541	18872	11011	15905	35480	55055	72183
	Lateral Load (plf)	202	300	300	300	300	300	300	300	300	300
10	Axial Load (lbs)	8353	12066	9591	14541	18872	11011	15905	35480	55055	72183
	Lateral Load (plf)	163	245	300	300	300	284	300	300	300	300
11	Axial Load (lbs)	7701	11551	9591	14541	18872	11011	15905	35480	55055	72183
	Lateral Load (plf)	135	203	280	300	300	235	300	300	300	300
12	Axial Load (lbs)	6811	10216	9591	14541	18872	11011	15905	35480	55055	72183
	Lateral Load (plf)	113	170	235	300	300	197	296	300	300	300
13	Axial Load (lbs)	6050	9076	9187	14541	18872	11011	15905	35480	55055	72183
	Lateral Load (plf)	97	145	200	300	300	168	252	300	300	300
14	Axial Load (lbs)	5400	8099	8230	12933	18170	10646	15905	35480	55055	72183
	Lateral Load (plf)	83	125	168	265	300	145	217	300	300	300
15	Axial Load (lbs)	4841	7261	7555	11872	15649	9684	14526	35480	55055	72183
	Lateral Load (plf)	73	109	137	215	284	126	189	300	300	300
16	Axial Load (lbs)	4359	6539	6944	10913	14385	8830	13245	35480	55055	72183
	Lateral Load (plf)	64	96	113	177	234	111	166	300	300	300
17	Axial Load (lbs)	3942	5913	6395	10050	13247	8072	12108	35480	55055	72183
	Lateral Load (plf)	57	85	94	148	195	98	147	300	300	300
18	Axial Load (lbs)	3579	5368	5902	9274	12225	7399	11098	35480	55055	72183
	Lateral Load (plf)	50	76	79	125	164	88	131	300	300	300
19	Axial Load (lbs)	3262	4892	5458	8577	11306	6799	10199	35480	55055	72183
	Lateral Load (plf)	45	68	67	106	140	79	118	300	300	300
20	Axial Load (lbs)	2983	4474	5060	7951	10481	6265	9397	32288	52705	69011
	Lateral Load (plf)	41	61	58	91	120	71	106	300	300	300
21	Axial Load (lbs)	2788	4182	4700	7386	9737	5787	8680	28718	48939	64100
	Lateral Load (plf)	36	53	50	78	103	64	97	300	300	300
22	Axial Load (lbs)	2622	3933	4376	6877	9066	5359	8038	25602	45273	59675
	Lateral Load (plf)	31	47	43	68	90	59	88	298	300	300
23	Axial Load (lbs)						4973	7460	24037	40911	55677
	Lateral Load (plf)						54	80	261	300	300
24	Axial Load (lbs)						4626	6940	22599	36999	51900
	Lateral Load (plf)						49	74	230	300	300
25	Axial Load (lbs)						4313	6469	21279	33480	47309
	Lateral Load (plf)						45	68	203	300	300
26	Axial Load (lbs)						4029	6043	20065	30914	43163
	Lateral Load (plf)						42	63	181	284	300
27	Axial Load (lbs)						3796	5693	18947	29214	39410
	Lateral Load (plf)						38	58	161	254	300
28	Axial Load (lbs)						3621	5432	17916	27643	36019
	Lateral Load (plf)						34	52	145	227	300
29	Axial Load (lbs)						3456	5184	16964	26191	34140
	Lateral Load (plf)						31	47	130	205	270
30	Axial Load (lbs)						3301	4951	16084	24846	32399
	Lateral Load (plf)						28	42	118	185	244

NOTES:

1. Values shown are the maximum axial loads, in pounds (lbs), and lateral loads, in pounds per lineal foot (plf), that can be applied to the column.
2. Selected column shall satisfy both total axial and lateral wind loads. Refer to page 3 for determining the lateral load.
3. The table is based on dry-use conditions. The values are based on a duration of load factor of 1.60 for combined axial and lateral loads, and 1.00 for axial load only.
4. The table is based on a compression perpendicular-to-grain stress of 450 psi.
5. 1-1/2-inch built-up columns have been designed for ES11 stud grade. Built-up columns shall be nailed in accordance with NDS 2012, 15.3.3.
6. One face of the column must be laterally supported by sheathing, fastened to meet the requirements of IRC or IBC. The other face must be sheathed with either structural sheathing or drywall.
7. Maximum spacing of full depth blocking is 8 ft.

24F HEADERS
L/180 LATERAL DEFLECTION RATIO

TABLE 7.
ALLOWABLE UNIFORM AND LATERAL LOADS (plf)

WIDTH (in.)	DEPTH (in.)	CRITERIA	ROUGH OPENING (ft)									
			3	4	5	6	7	8	9	10	11	12
5-1/2	3-1/2	L/240 TL	697	402	257	176	128	84	51	--	--	--
		L/180 WL	500	500	500	500	500	461	327	--	--	--
		End B.	1.50	1.50	1.50	1.50	1.50	1.50	1.50	--	--	--
	5-1/2	L/240 TL	2785	2128	1438	806	396	304	240	165	112	77
		L/180 WL	500	500	500	500	472	364	290	236	196	165
		End B.	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
	7-1/4	L/240 TL	3671	2805	2269	1759	1012	531	420	340	263	184
		L/180 WL	500	500	500	500	500	480	382	311	258	218
		End B.	1.90	1.90	1.90	1.70	1.50	1.50	1.50	1.50	1.50	1.50
	9-1/4	L/240 TL	4684	3579	2895	2430	2093	1245	686	556	459	385
		L/180 WL	500	500	500	500	500	500	488	397	330	278
		End B.	2.40	2.40	2.40	2.40	2.40	1.60	1.50	1.50	1.50	1.50
	11-1/4	L/240 TL	5696	4353	3521	2955	2545	2235	1394	823	680	570
		L/180 WL	500	500	500	500	500	500	500	483	401	338
		End B.	2.90	2.90	2.90	2.90	2.90	2.90	2.00	1.50	1.50	1.50
7	3-1/2	L/240 TL	887	512	327	225	163	107	65	--	--	--
		L/180 WL	500	500	500	500	500	500	500	--	--	--
		End B.	1.50	1.50	1.50	1.50	1.50	1.50	1.50	--	--	--
	5-1/2	L/240 TL	2128	1208	771	532	387	293	228	174	117	80
		L/180 WL	500	500	500	500	500	500	500	500	500	456
		End B.	1.70	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
	7-1/4	L/240 TL	4672	3570	2888	2243	1663	1187	747	434	335	234
		L/180 WL	500	500	500	500	500	500	500	491	407	343
		End B.	1.90	1.90	1.90	1.70	1.50	1.50	1.50	1.50	1.50	1.50
	9-1/4	L/240 TL	5961	4555	3684	3092	2664	2087	1561	1030	640	492
		L/180 WL	500	500	500	500	500	500	500	500	500	438
		End B.	2.40	2.40	2.40	2.40	2.40	2.10	1.80	1.50	1.50	1.50
	11-1/4	L/240 TL	7250	5540	4481	3761	3239	2844	2451	1862	1277	840
		L/180 WL	500	500	500	500	500	500	500	500	500	500
		End B.	2.90	2.90	2.90	2.90	2.90	2.90	2.80	2.30	1.80	1.50

NOTES:

1. Values shown are the maximum uniform (vertical) and lateral loads, in pounds per linear foot (plf), that can be applied to the header in addition to its own weight.
2. Selected header shall satisfy both total vertical (TL) and wind loads (WL). Refer to page 3 for determining the lateral load.
3. The table is based on uniform loads and dry-use conditions. The values are based on a duration of load factor of 1.60 for combined uniform and lateral loads, and 1.00 for uniform load only.
4. The total load deflection is limited to the most restrictive of L/240 or 5/16 inch.
5. Trimmers shall support the full header width. Verify trimmer maximum allowable axial load to support the header.
6. Multiple pieces may be used when properly connected.
7. Sufficient bearing length shall be provided at supports. Review bearing length requirements (shown in inches) to ensure adequacy.

DESIGN VALUES
FOR NORDIC LAM™

DESIGN PROPERTIES (1,2,3)

APPLICATION	WALL STUDS	COLUMNS
APPEARANCE GRADE	INDUSTRIAL	INDUSTRIAL
STRESS GRADE	ES11	ES12
EWS LAYUP COMBINATION	ES11/NPG	ES12/NPG
Bending About X-X Axis		
Bending at Extreme Fibre (F_{bx})(4,5)	1350 psi	2400 psi
Longitudinal Shear (F_{vx})(6)	250 psi	250 psi
Compression Perpendicular to Grain (F_{cpx})	450 psi	600 psi
Shear-Free Modulus of Elasticity (E_x)	1.6E+06 psi	1.9E+06 psi
Apparent Modulus of Elasticity ($E_{x,app.}$)(7)	1.5E+06 psi	1.8E+06 psi
Bending About Y-Y Axis		
Bending at Extreme Fibre (F_{by})(8)	1750 psi	2400 psi
for 3 laminations	1600 psi	2400 psi
Longitudinal Shear (F_{vy})(6)	175 psi	250 psi
Compression Perpendicular to Grain (F_{cpy})	450 psi	600 psi
Shear-Free Modulus of Elasticity (E_y)	1.6E+06 psi	1.9E+06 psi
Apparent Modulus of Elasticity ($E_{y,app.}$)(7)	1.5E+06 psi	1.8E+06 psi
Axially Loaded		
Compression Parallel to Grain (F_c)	1550 psi	2300 psi
for 3 laminations	1350 psi	1700 psi
Tension Parallel to Grain (F_t)	975 psi	1600 psi
Modulus of Elasticity (E_a)(7)	1.6E+06 psi	1.9E+06 psi
Specific Gravity	0.41	0.46
Density (for Member Weight)	35 pcf	35 pcf

(1) The combinations in this table are applicable to members consisting of 4 or more laminations, unless otherwise noted.

(2) The tabulated design values are for dry conditions of use. For wet conditions of use, multiply the tabulated values by the wet service factors, C_M, per ANSI/AWC NDS-2012, 5.3.3.

(3) The tabulated design values are for normal duration of loading. For other durations of loading, see applicable design code (ANSI/AWC NDS-2012, 2.3.2 and Chapter 5).

(4) Nordic Lam bending members are symmetrical throughout the depth of the member (balanced layups).

(5) The tabulated design values in bending, F_{bx}, shall be multiplied by a volume factor, C_v. The volume factor formula is: $C_v = (12/d)^{1/10} \times (5.125/b)^{1/10} \times (21/L)^{1/10} \leq 1.0$, where d = beam depth (in.), b = beam width (in.), and L = beam length (ft).

(6) For non-prismatic members, notched members, members subject to impact or cyclic loading, or shear design of bending members at connections (ANSI/AWC NDS-2012, 3.4.3.3), the design value for shear (F_{vx} and F_{vy}) shall be multiplied by a factor of 0.72.

(7) The tabulated apparent E values already include a 5% shear deflection. For beam stability and column stability calculations, E_{min} shall be determined by multiplying the tabulated apparent modulus of elasticity by 0.528.

(8) The F_{by} values shall be permitted to be increased by multiplying by the size factor, $(12/d)^{1/9}$, where d is the beam depth in inches.

(9) Design of glulam members shall be in accordance to National Design Specification, 2012 Edition.

Refer to the Nordic Lam Design and Construction Guide for more information.
The Nordic Lam products are listed in APA Product Report PR-L294.

NORDIC ENGINEERED WOOD

Sustainable Wood Solutions

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